When a leaky tube is discovered, the ends are plugged and the tube placed out of action for the time being until enough tubes have been plugged to affect seriously the efficiency of the plant as a whole. By this time a new set of condenser tubes should be ready to go in. This is a very expensive method, but appears to be the cheapest one discovered. Many attempts have been made to repair condenser tubes by soldering up the holes, by brazing them, and by electric welding, &c. Up to the present all have proved useless. The difficulty is that of closing the hole with metal of exactly the same thickness as that of which the body of the tube is made. The metal must not project externally, otherwise the tube could not be fitted into its position through the tube-plates; on the other hand, if it projects internally, the usual cleaning brushes will not readily pass along the tube.

Air-pumps.—The " best " air-pump is apparently still to be produced. The reciprocating pump is becoming unpopular for several reasons. Firstly, the cost of its maintenance is high; secondly, its efficiency as a vacuum pump is low; and thirdly, it is unable to deal with large quantities of air, should a serious leak develop in the condenser system. Among its advantages is the low power it takes to drive it.

The " kinetic " pump is a good one. This pump consists of three centrifugal pumps mounted on one common spindle, working in conjunction with a steam jet. It may be run at speeds of 1500 to 2000 r.p.m. It usually has three simple bearings which require attention, but no more attention than is given to the ordinary ring oil bearings of an induction motor. The cost of maintenance is reduced to an almost negligible amount. Plants have been at work now for many years. Some plants, in particular, have been opened out once a year for examination over a period of three years, and have been put together again without requiring attention in any detail whatever, although running on an average of fourteen hours per day throughout the year. This kind of pump appears to have nearly reached perfection

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There are many other types of rotary air-pump on the market, such as the Leblanc pump. This pump is quite different from the " kinetic " pump, although it is -a rotary pump. Its essential feature is a revolving wheel something like a turbine wheel. The blades pass a fixed jet of water and cut off slices of water which are thrown down the throat tube of the pump. The space between these slices is filled with air which is expelled by the momentum of the water imprisoning it.

When a condenser can be kept reasonably free from air leaks, and the boiler plant is also normally operated, i.e. where no excessive quantity of air is permitted to get into the steam system, this pump will give very good service, and maintain possibly quite as high vacuum as the kinetic pump; but it has the very serious disadvantage, that when a heavy air leak develops, the pump is unable to deal with the extra air and the vacuum falls off very

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shut down the condensing system.

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